

NASA SBIR/STTR Technologies

S1.08-9925 - Multi Wavelength Greenhouse gas LIDAR (MUGGLE)



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Identification and Significance of Innovation

Climate change is a growing concern, leading NASA to the need to track concentrations of such greenhouse gases as CO₂ and CH₄, including the need to detect them daytime, nighttime, and all year. To achieve this, NASA has proposed such projects as Global Precipitation Measurement, Geostationary Coastal and Air Pollution Events, and Active Sensing of CO₂ Emissions over Nights, Days, and Seasons. In support of these programs, and in particular ASCENDS, Luminit, LLC, proposes to develop the innovative Multiwavelength Greenhouse Gas Lidar (MUGGLE). The MUGGLE is a high-resolution spectroscopic measurement system that can detect and measure CO, CO₂, CH₄, and H₂O (vapor) with great accuracy and speed. The MUGGLE will be fully automated, using only eye-safe laser wavelengths and powers, with tunability and real-time calibration. The MUGGLE will achieve laser linewidth <50 MHz for the best resolution, and significantly improves on existing greenhouse gas measurement technology.

Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)

Technical Objectives and Work Plan

Technical Objectives

Objective 1. Development of complete, physics-based MUGGLE model and design

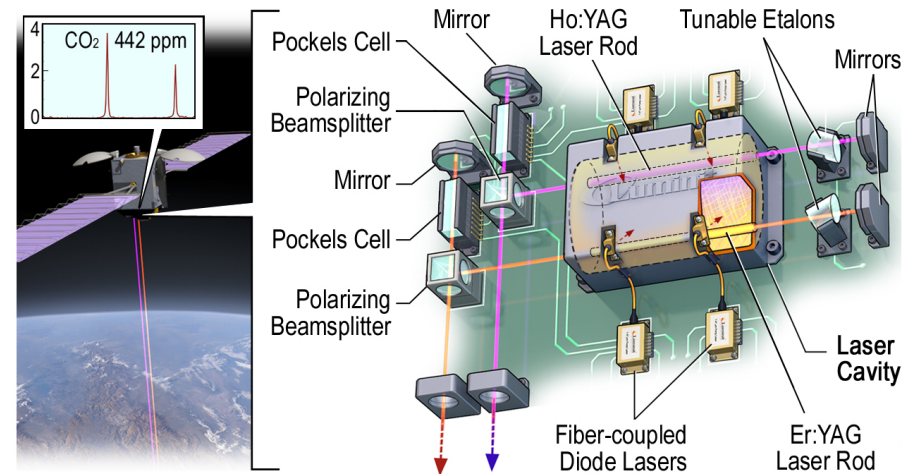
Objective 2. Fabrication and feasibility test of the MUGGLE prototype

Objective 3. Understanding of the operation and launch environments

Objective 4. Preliminary definition of the commercial market for the MUGGLE.

Work Plan

1. Design Complete MUGGLE
2. Develop Complete Computer Model of the MUGGLE
3. Optimize Subsystem Design
4. Study Environmental Effects
5. Demonstrate Feasibility of MUGGLE
6. Explore Commercial Potential and Product Viability
7. Prepare and Submit Reports.



NASA Applications

Systems like ASCENDS, OCO-2, GPM, GEO-CAPE, etc. will immediately benefit from MUGGLE technology. Other fielded projects will follow, e.g., ocean biology and biogeochemistry. The NASA Glenn Chemical Species Gas Sensors Team is developing gas sensing technology for aeronautic and space applications which can be addressed by the MUGGLE, especially since its laser rods can be changed to other materials in order to reach different spectral regions. These are ideal applications of MUGGLE technology.

Non-NASA Applications

Gas detection sensors are becoming more and more important in the commercial world. Gases such as CO, CO₂, and especially CH₄ need to be measured with accuracy and speed, which is where the MUGGLE demonstrates its greatest improvement over state of the art. The first commercial application of the MUGGLE is likely to be a CH₄ sensor for use finding industrial and pipe leaks.

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NON-PROPRIETARY DATA